

# The Business Case for Green Materials

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# Topics

## Business Case for Green Materials

- Materials Restrictions in the Electronics Industry
- Costs of Complying with Materials Restrictions

## Supply Chain Management for Green Materials

- Articulating Materials Goals
- Driving Development of Green Materials
- White Lists

Substance Restriction in the Electronics Industry

# **BACKGROUND**

# The Law That Changed the Electronics Industry

## RoHS

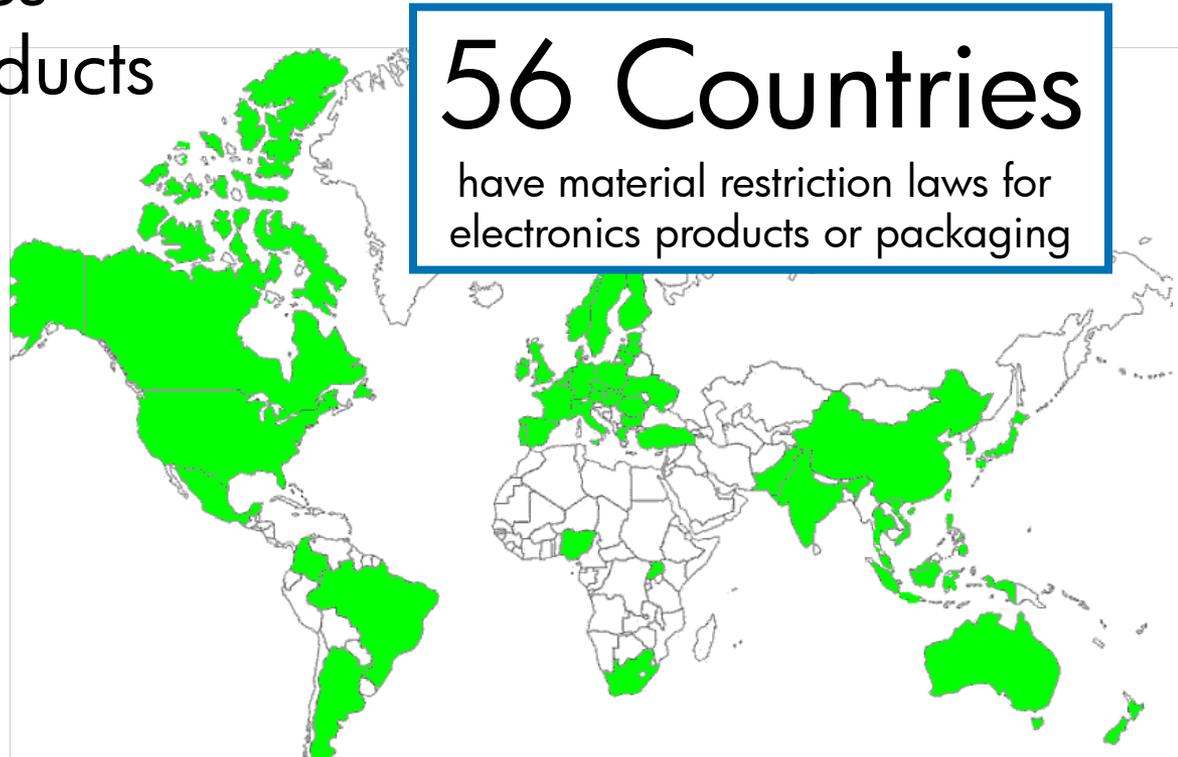
EU Directive  
2002/95/EC on the  
Restriction of the Use of  
certain Hazardous  
Substances in Electrical  
and Electronic  
Equipment



Logo from companion regulation  
Waste Electrical and Electronic  
Equipment (WEEE) Directive

# Material Restrictions for Electronics

- Major class of product regulation
- Specific substances disallowed in products and packaging
- Material content reporting



# **COSTS OF COMPLYING WITH MATERIALS RESTRICTIONS**

# Replacing Materials is Expensive

- Direct material cost for replacement
  - Easy to track
- Transition costs
  - Distributed
  - Hard to track and measure
- Ongoing compliance costs



# Examples of Transition Costs

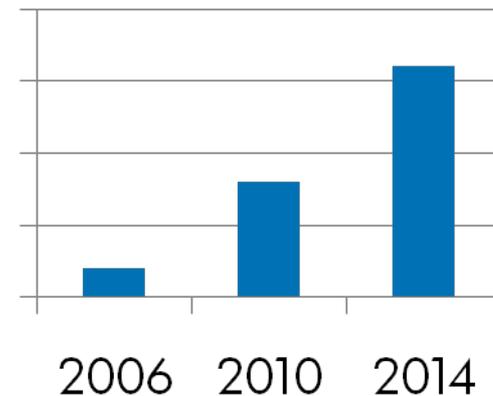


- R&D for replacements
- Supplier communications
- Analytical testing
- New part numbers
- Component qualifications
- Manufacturing process adjustments
- Product redesign
- Product qualifications
- New regulatory certifications

# Business Environment

- Increasing regulations
  - More substances restricted
  - More reporting requirements
  - More supplier responsibility for product content and recycling
  - Lack of harmonization between countries/regions
- World-wide customer trend to more interest in chemicals and exposure

Number of Environmental Regulations that Apply to Electronics Products



# Adapting to the New Environment

- Create systems to minimize the impact of increasing regulation
  - Lower transition costs for restricted materials
  - Maintain market access more efficiently (compliance)
- ➔ Anticipate regulation
  - Choose better replacement materials to avoid multiple substitutions



# Example: Anticipating Regulation

- DEHP = plasticizer
- Widely used in electronics
- Potential restrictions
  - RoHS
  - REACH
  - TSCA
  - More



# Different Material Selection Options

**If Restricted**

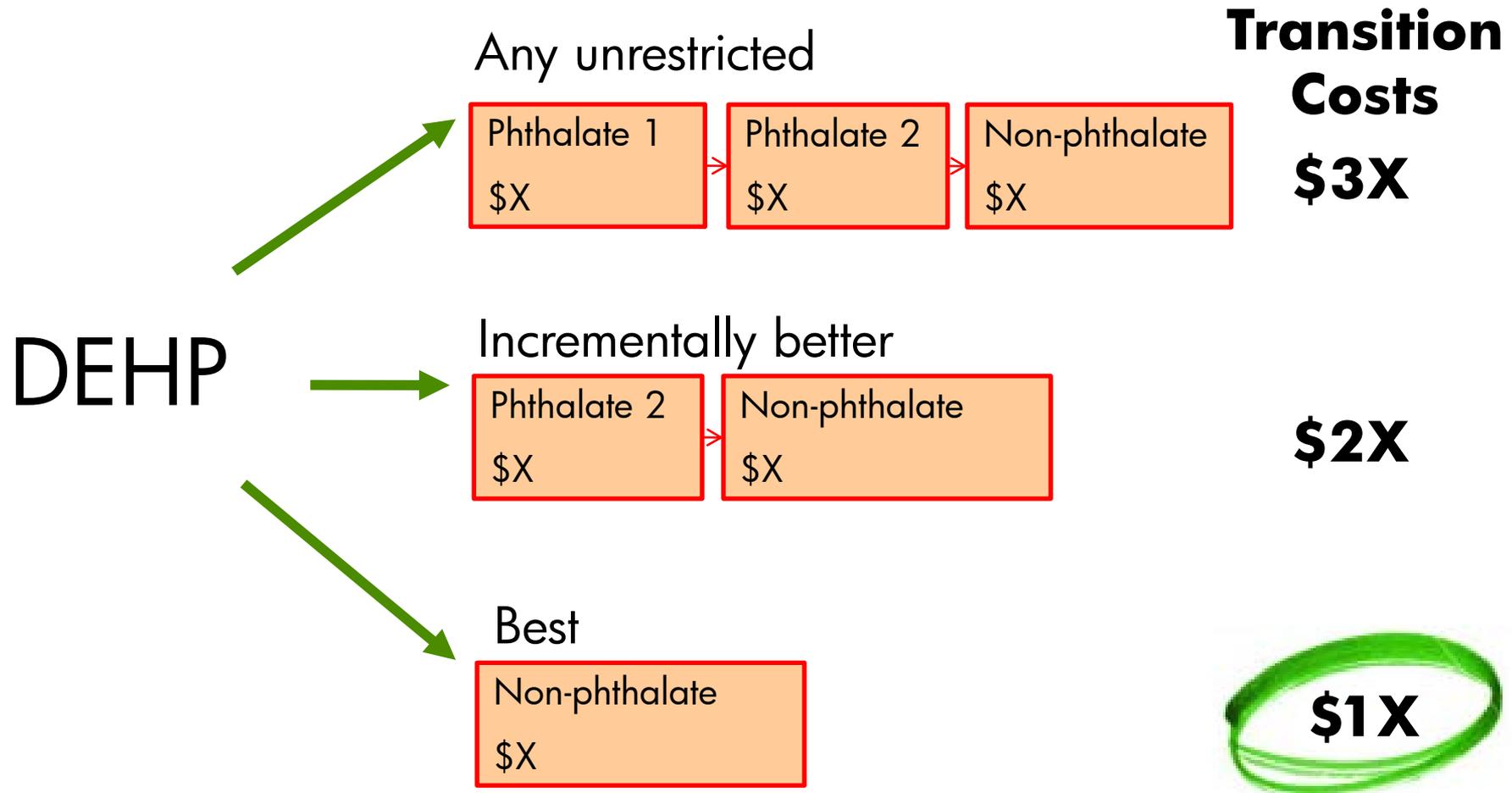
**DEHP**

Any unrestricted replacement  
Phthalate 1 (Benchmark 1)

Incrementally better replacements  
Phthalate 2 (Benchmark 2)

Better replacements  
Non-phthalate (Benchmark 4)

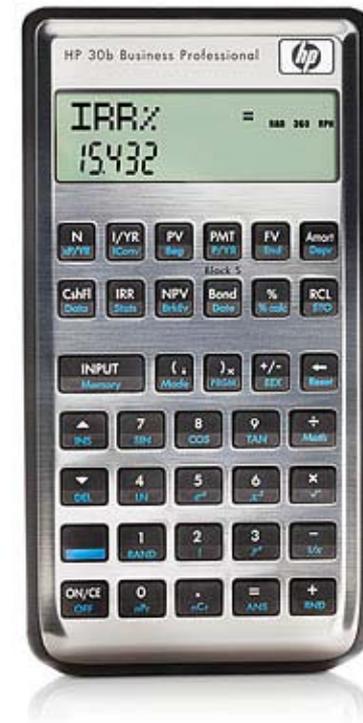
# Avoiding Extra Substitutions Saves Money



*\*Phthalates 1 and 2 and non-phthalate cost more than DEHP, but the cost differences between them is modest*

# Avoid Multiple Substitutions

- When selecting replacements for restricted substances, screen alternatives to avoid substances that might be restricted in the future
- May need to go higher in management chain to reach right decision-maker for support
  - Beyond procurement



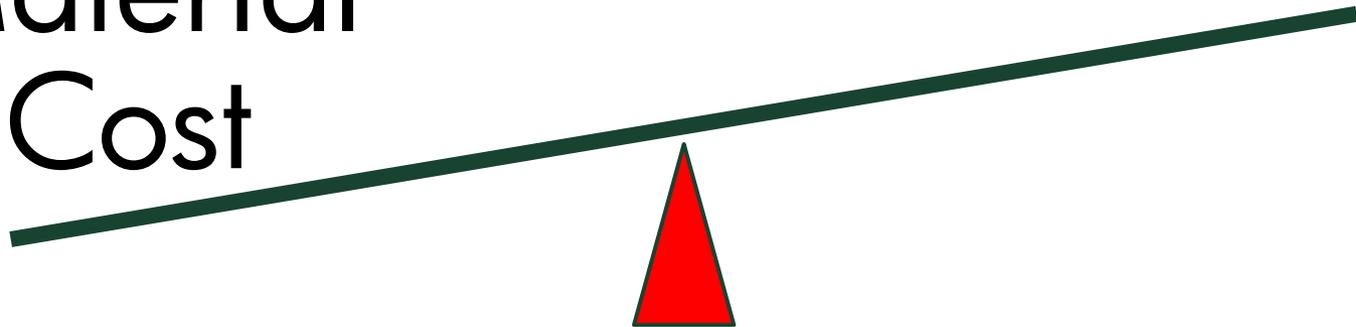
# **SUPPLY CHAIN MANAGEMENT FOR GREEN MATERIALS**

# Replacement Material Selection Criteria

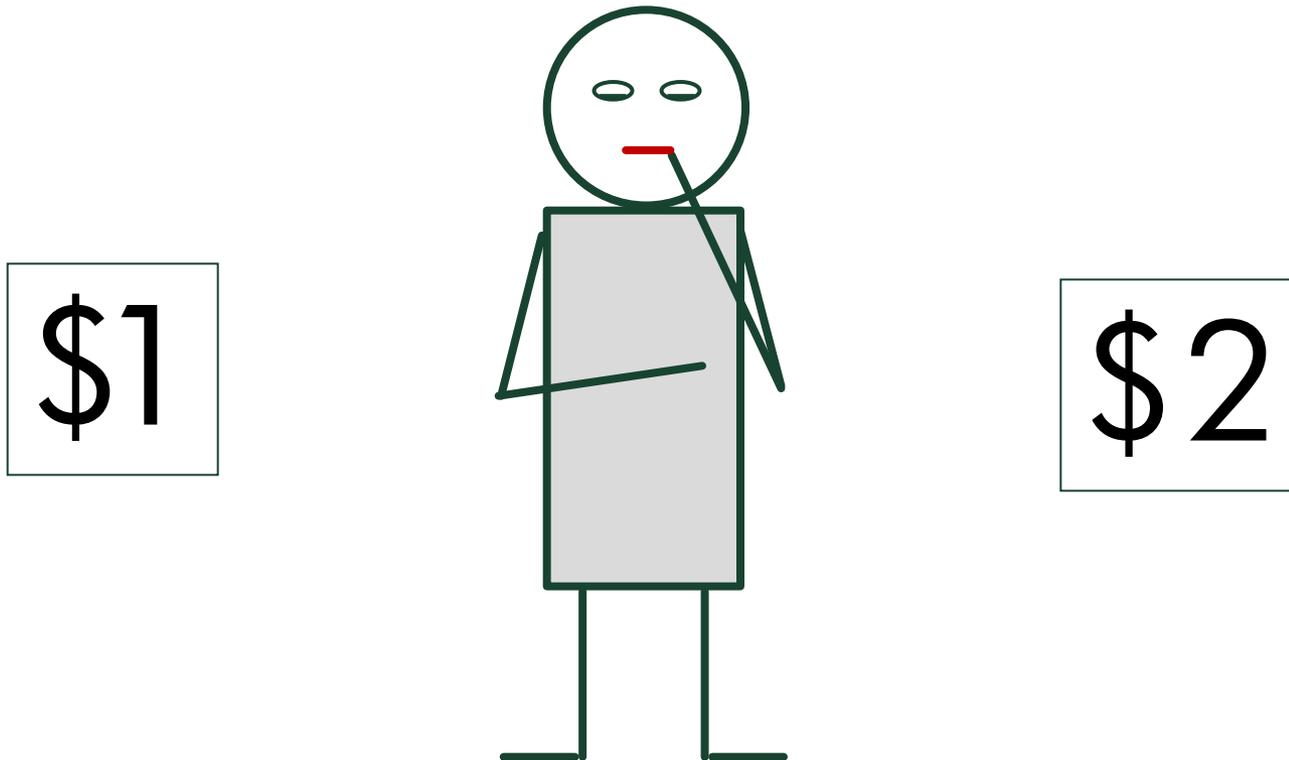
Material  
Cost

Transition costs

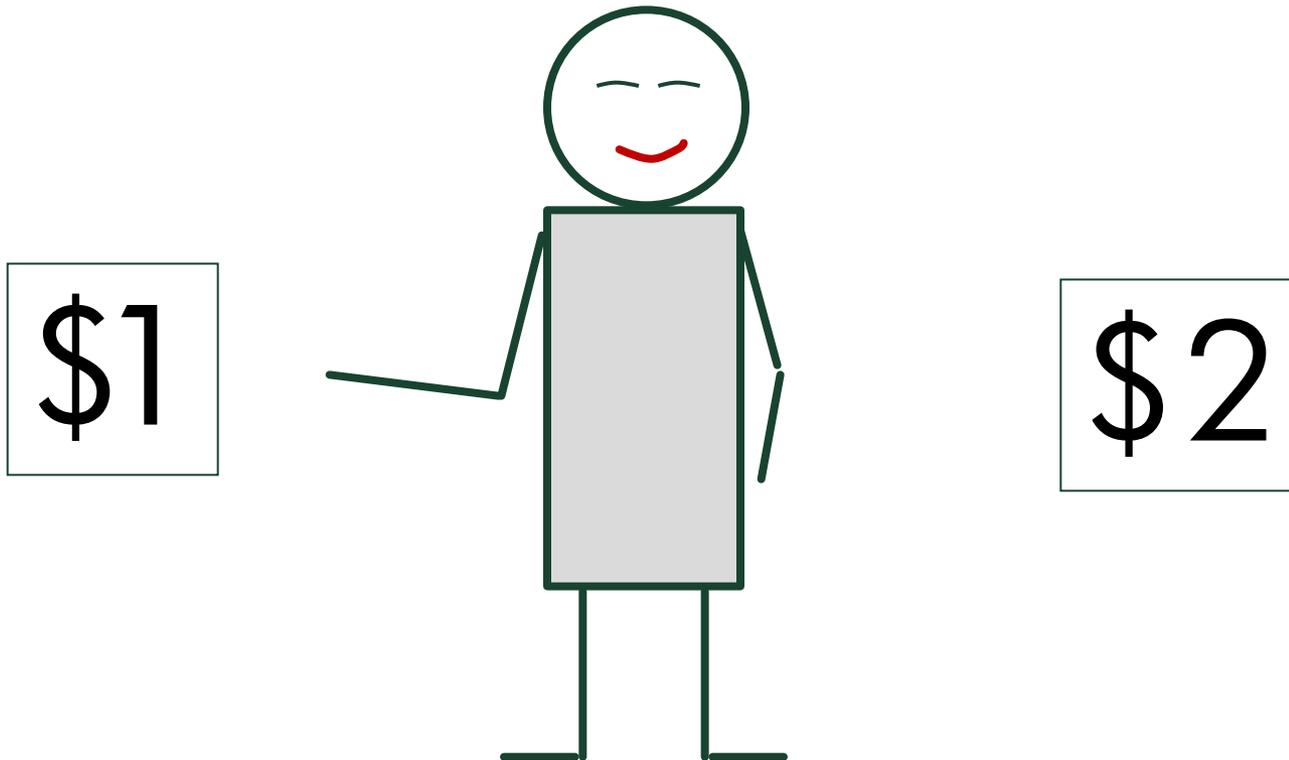
Ongoing  
compliance costs



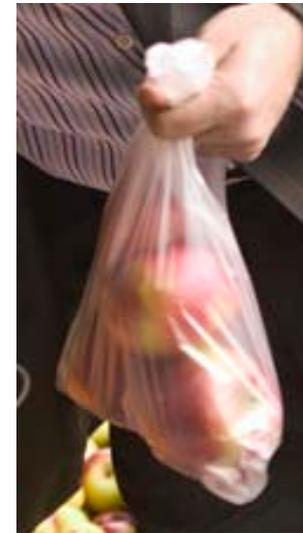
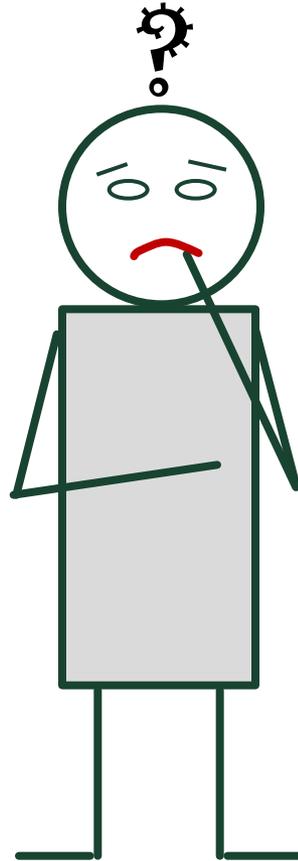
# Procurement is Very Good with Numbers



# You get a raise!



# Not as Good with Environmental Criteria





# Green Screen Alternatives Assessment

- Green Screen is the primary tool HP uses for alternatives assessment when replacing a restricted substance
  - Aligns with regulators
- Enables identification of better materials, not just minimum acceptable



More information available at  
<http://www.cleanproduction.org>

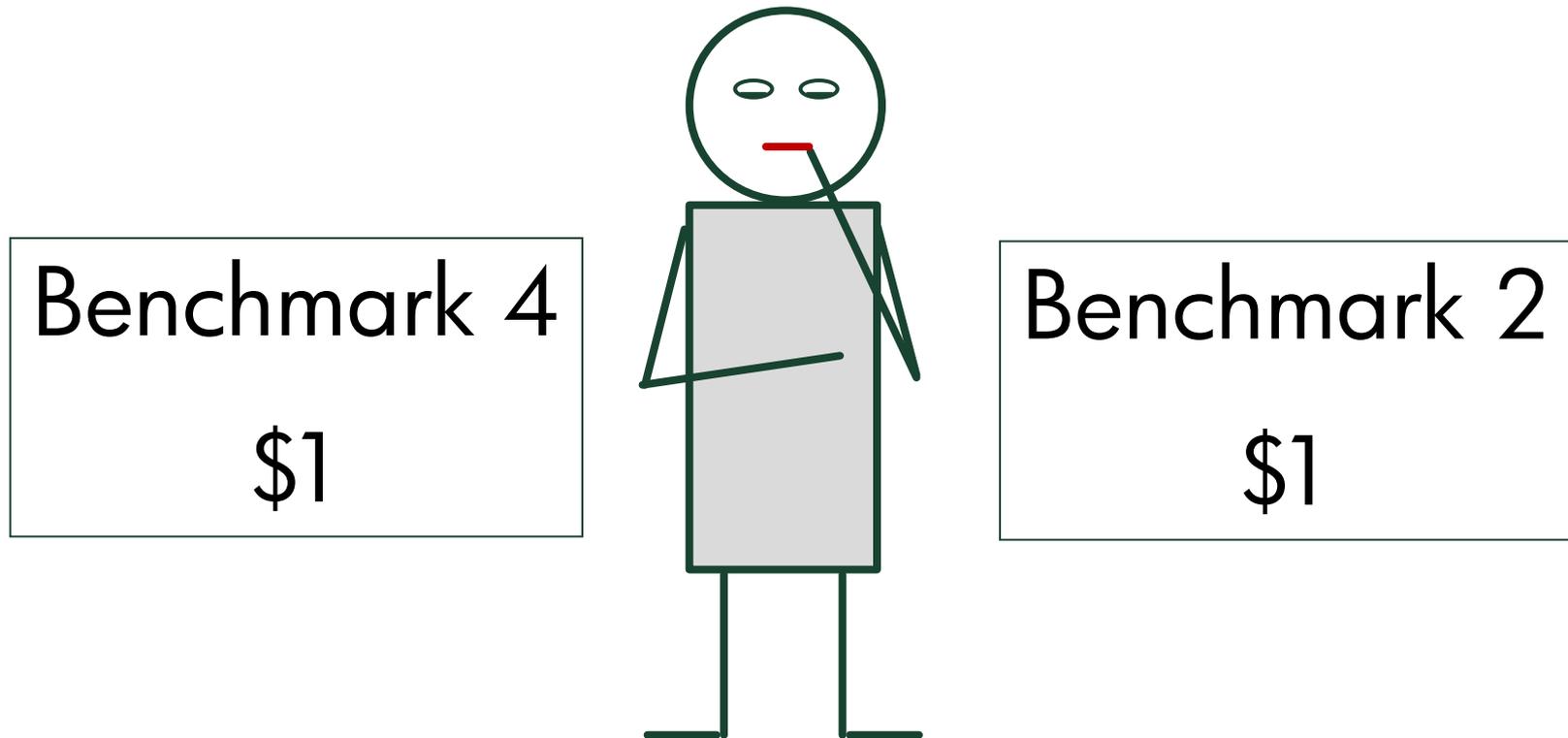
# Simple 1-4 score (1=bad, 4=good)

- Expert knowledge needed to generate score
- Simple score can be used by non-experts
- Add Risk Assessment, LCA, Carbon Footprint, as needed

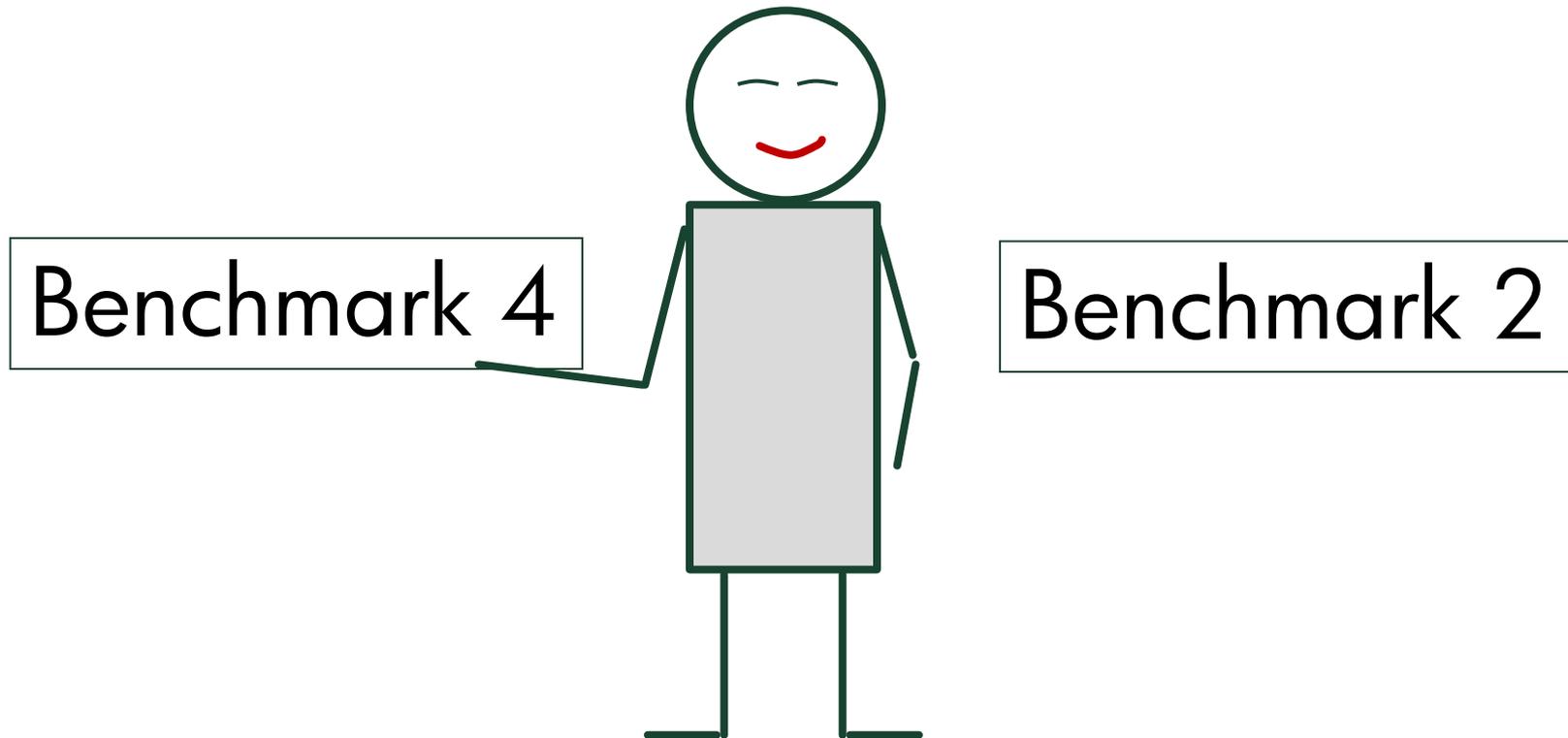


GS Rating	Fate		Ecotoxicity	
	P	B	AA	CA
Chem#1	H	L	H	H
Chem#2	nd	vH	H	H
Chem#3	vH	vH	H	H
Chem#4	M	L		H

# Helps Procurement Make Decisions



# You get a raise!



Making Sure Procurement Has Options to Choose

# **DRIVING DEVELOPMENT OF GREEN MATERIALS**

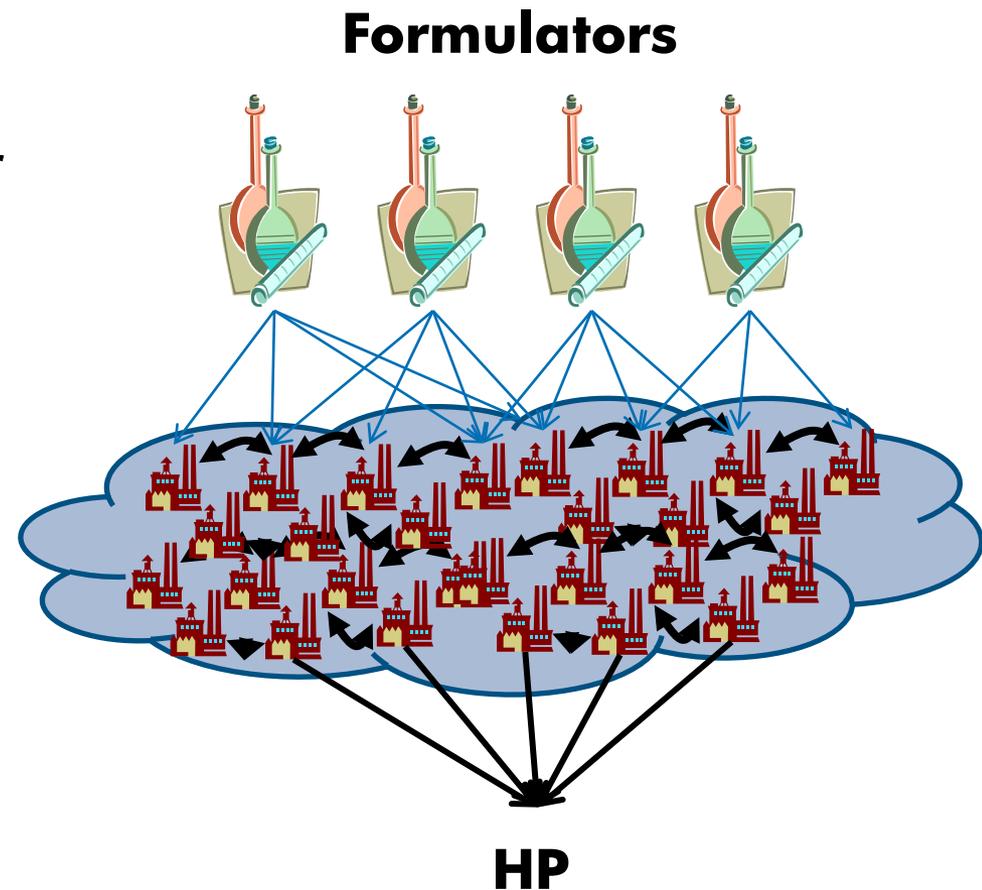
# Articulating Materials Goals

- If we don't articulate environmental requirements to suppliers, we won't get better materials



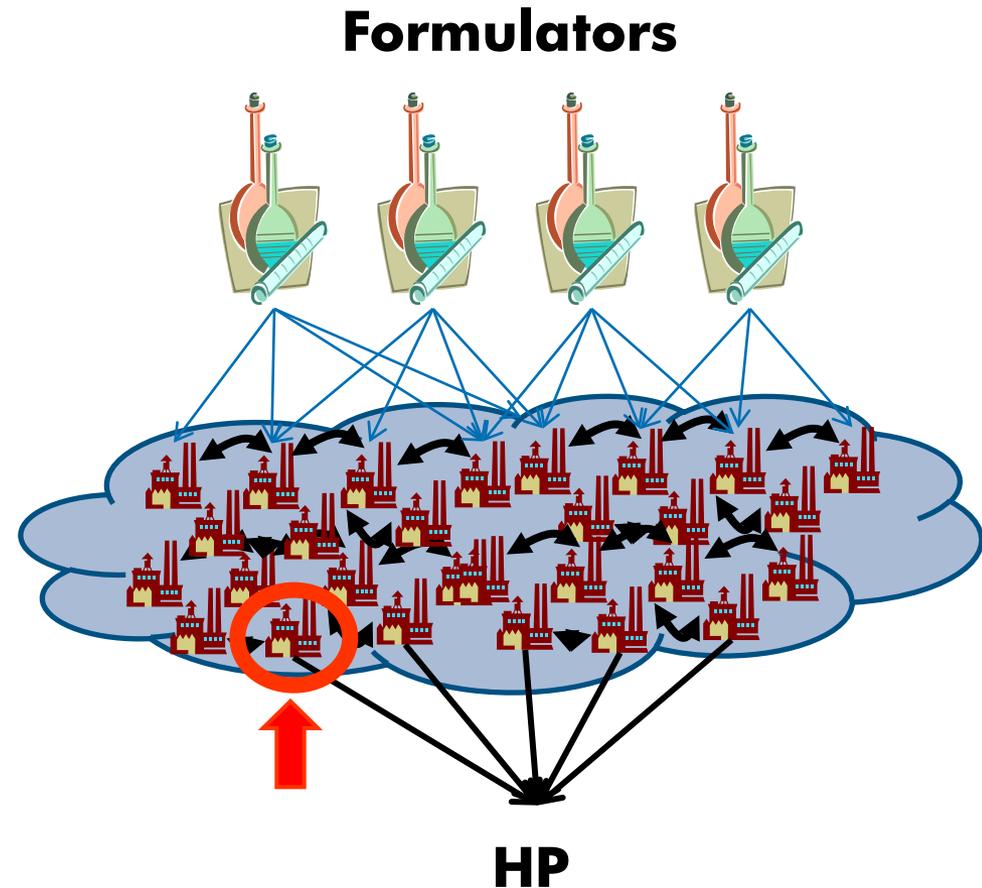
# Electronics Supply Chain is Complicated

- Relatively small number of formulators
- Large number of intermediate suppliers
- Small number of OEMs



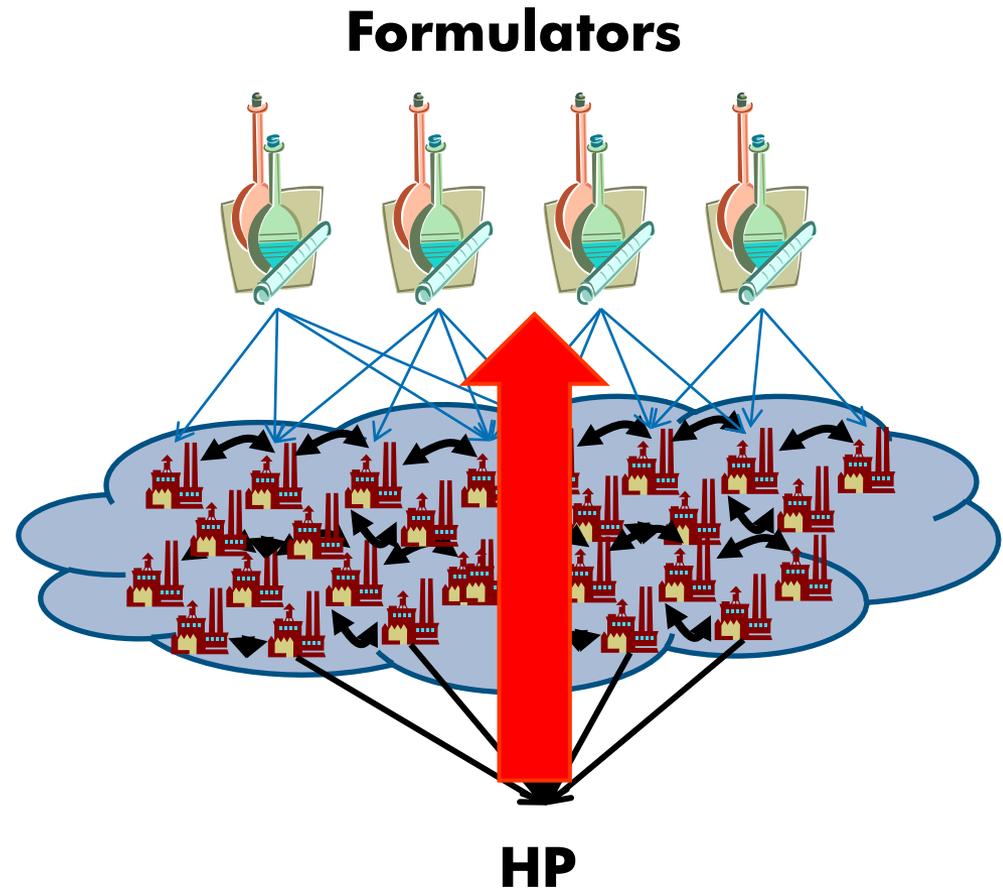
# Pushing a Rope

- Trying to push requirements up through the supply chain doesn't always work
- All feedback transmitted to formulators becomes "lower cost"



# Engaging with Formulators

- Large companies can engage directly with formulators
- Give a range of feedback, in addition to cost
- Successfully used with other materials criteria (not just environment)



# Influencing What's on the Menu

- Introducing Green Screen to formulators
- Encouraging design of green materials from the beginning
  - Reduces cost adders
- Effective approach for larger companies



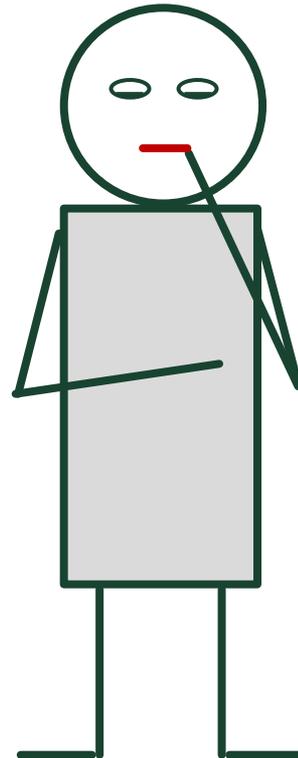
Creating Demand for Green Materials in the Supply Chain

# WHITE LISTS

# Reduce Cost Adder for Green Materials

Benchmark 4  
\$1.50 → \$1

Increase Volume



Benchmark 2  
\$1

# Create Pull for Green Materials

- Approved materials lists
  - Screening required for material approval
- White lists
  - Strongly favored by suppliers and procurement teams
  - Better if shared across industry (not company-specific)

Green Screen Assessments of Similar Function Chemical		
Common Name	CAS #	Full Name
<b>Preferred</b>		
Design	none	Design material out, dematerialize
Substance 0	#####-##-#	Chemical name
<b>Use but still opportunity for improvement</b>		
Substance 1	#####-##-#	Chemical name
Substance 2	#####-##-#	Chemical name
<b>Use but search for alternatives</b>		
Substance 3	#####-##-#	Chemical name
Substance 4	#####-##-#	Chemical name
Substance 5	#####-##-#	Chemical name
Substance 6	#####-##-#	Chemical name
<b>DO NOT USE</b>		
Substance 7	#####-##-#	Chemical name
Substance 8	#####-##-#	Chemical name
Substance 9	#####-##-#	Chemical name
Substance 10	#####-##-#	Chemical name
Substance 11	#####-##-#	Chemical name
Substance 12	#####-##-#	Chemical name

# WRAP-UP

# Green Materials and Business

- Avoid multiple substitutions by screening replacements for restricted substances
- Articulate environmental goals to suppliers and chemical formulators
- Incorporate environmental specs into existing procurement processes
- Support creation and use of industry-wide white lists



**THANK YOU**